Complete Summary

GUIDELINE TITLE

Managing oral anticoagulant therapy. In : Sixth ACCP Consensus Conference on Antithrombotic Therapy.

BIBLIOGRAPHIC SOURCE(S)

Ansell J, Hirsh J, Dalen J, Bussey H, Anderson D, Poller L, Jacobson A, Deykin D, Matchar D. Managing oral anticoagulant therapy. Chest 2001 Jan;119(1 Suppl):22S-38S. [168 references]

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Conditions or diseases that can benefit from anticoagulant therapy for the prevention or management of thromboembolic disorders, including:

- Venous thrombosis
- Pulmonary embolism
- Systemic embolism
- Tissue heart valves
- Acute myocardial infarction
- Valvular heart disease
- Atrial fibrillation
- Mechanical prosthetic valves
- Thrombosis and the antiphospholipid syndrome

GUIDELINE CATEGORY

Management
Prevention

CLINICAL SPECIALTY

Cardiology
Critical Care
Emergency Medicine
Family Practice
Internal Medicine
Obstetrics and Gynecology
Pulmonary Medicine

INTENDED USERS

Physicians

GUIDELINE OBJECTIVE(S)

To present an evidence-based approach to managing anticoagulant therapy leading to better patient outcomes and fewer adverse events

TARGET POPULATION

Patients requiring oral anticoagulant management

INTERVENTIONS AND PRACTICES CONSIDERED

Oral Anticoagulant Therapy: Warfarin Therapy for Prevention/Management:

1. Practical dosing
    a. Initiation and maintenance dosing of warfarin
    b. Anticoagulation therapy in the elderly
2. Management of physiologic and pharmacologic factors, such as interacting drugs or illnesses, that affect the pharmacokinetics or pharmacodynamics of warfarin
3. Management of dietary or gastrointestinal factors that affect the availability of vitamin K_1
4. Management of physiologic factors that affect the synthetic or metabolic fate of the vitamin K-dependent coagulation factors
5. Management of patient-specific factors (such as adherence to a therapeutic plan) through patient communication and education
6. Laboratory monitoring (prothrombin time, international normalized ratio)
7. Measures to reduce elevated international normalized ratio
    a. Discontinuation of warfarin therapy
    b. Administration of vitamin K_1
    c. Infusion of fresh frozen plasma or prothrombin concentrate
8. Dosing and follow-up
9. Management of adverse events, such as bleeding
10. Diagnostic evaluation of bleeding
11. Oral anticoagulant therapy in combination with low-dose heparin or low-molecular weight heparin
12. In patients undergoing dental procedures, as appropriate, administration of a mouthwash acid or epsilon amino caproic acid

13. Anticoagulation management models
    a. Anticoagulation clinics
    b. Point-of-care patient self-testing and self-management
    c. Computer program dose management

MAJOR OUTCOMES CONSIDERED

Safety and efficacy of treatment, as measured by the following:

- Intensity of anticoagulation (prothrombin time, prothrombin ratio, international normalized ratio)
- Rates and frequency of complications or adverse events, such as minor or major bleeding and mortality
- Rates and frequency of thromboembolism

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The participants reviewed information from an exhaustive review of the literature.

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

The rating scheme framework captures the trade-off between benefits and risks (1 or 2) (see "Rating Scheme for the Strength of the Recommendations") and the methodologic quality of the underlying evidence (A, B, C+, or C).

Grades of evidence for antithrombotic agents:

1A
Methodological strength of supporting evidence: randomized controlled trials without important limitations

1B
Methodological strength of supporting evidence: randomized controlled trials with important limitations (inconsistent results, methodologic flaws*)

1C+
Methodological strength of supporting evidence: no randomized controlled trials, but randomized controlled trial results can be unequivocally extrapolated; or, overwhelming evidence from observational studies

1C
Methodological strength of supporting evidence: observation studies

2A
Methodological strength of supporting evidence: randomized controlled trials without important limitations

2B
Methodological strength of supporting evidence: randomized controlled trials with important limitations (inconsistent results, methodologic flaws*)

2C
Methodological strength of supporting evidence: observational studies

* Such situations include randomized controlled trials with lack of blinding, and subjective outcomes, in which the risk of bias in measurement of outcomes is high; and randomized controlled trials with large loss to follow-up.

METHODS USED TO ANALYZE THE EVIDENCE

Meta-Analysis
Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not applicable

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus (Consensus Development Conference)

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

The strength of any recommendation depends on two factors: the trade-off between benefits and risks, and the strength of the methodology that leads to estimates of the treatment effect. The rating scheme used for this guideline captures these factors. The guideline developers grade the trade-off between benefits and risks in two categories: (1) the trade-off is clear enough that most patients, despite differences in values, would make the same choice; and (2) the trade-off is less clear, and each patient's values will likely lead to different choices.

When randomized trials provide precise estimates suggesting large treatment effects, and risks and costs of therapy are small, treatment for average patients with compatible values and preferences can be confidently recommended.

If the balance between benefits and risks is uncertain, methodologically rigorous studies providing grade A evidence and recommendations may still be weak (grade 2). Uncertainty may come from less precise estimates of benefit, harm, or costs, or from small effect sizes.

There is an independent impact of validity/consistency and the balance of positive and negative impacts of treatment on the strength of recommendations. In situations when there is doubt about the value of the trade-off, any recommendation will be weaker, moving from grade 1 to grade 2.

Grade 1 recommendations can only be made when there are precise estimates of both benefit and harm, and the balance between the two clearly favors recommending or not recommending the intervention for the average patient with compatible values and preferences. Table 2 of the original guideline document summarizes how a number of factors can reduce the strength of a recommendation, moving it from grade 1 to grade 2. Uncertainty about a recommendation to treat may be introduced if the target event that is trying to be prevented is less important (confident recommendations are more likely to be made to prevent death or stroke than asymptomatic deep venous thrombosis); if the magnitude of risk reduction in the overall group is small; if the risk is low in a particular subgroup of patients; if the estimate of the treatment effect, reflected in a wide confidence interval (CI) around the effect, is imprecise; if there is substantial potential harm associated with therapy; or if there is an expectation for a wide divergence in values even among average or typical patients. Higher costs would also lead to weaker recommendations to treat.

The more balanced the trade-off between benefits and risks, the greater the influence of individual patient values in decision making. If they understand the benefits and risks, virtually all patients will take aspirin after myocardial infarction or will comply with prophylaxis to reduce thromboembolism after hip replacement. Thus, one way of thinking about a grade 1 recommendation is that variability in patient values or individual physician values is unlikely to influence treatment choice in average or typical patients.

When the trade-off between benefits and risks is less clear, individual patient values will influence treatment decisions even among patients with average or typical preferences.

Grade 2 recommendations are those in which variation in patient values or individual physician values will often mandate different treatment choices, even among average or typical patients.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

The rating scheme framework captures the trade-off between benefits and risks (1 or 2) and the methodologic quality of the underlying evidence (A, B, C+, or C) (see "Rating Scheme for the Strength of the Evidence").

Grades of recommendation for antithrombotic agents:

1A
Clarity of risk/benefit: risk/benefit clear
Implications: strong recommendation; can apply to most circumstances, without reservation

1B
Clarity of risk/benefit: risk/benefit clear
Implications: strong recommendation; likely to apply to most patients

1C+
Clarity of risk/benefit: risk/benefit clear
Implications: strong recommendation; can apply to most patients in most circumstances

1C
Clarity of risk/benefit: risk/benefit clear
Implications: intermediate-strength recommendation; may change when stronger evidence available

2A
Clarity of risk/benefit: risk/benefit unclear
Implications: intermediate strength recommendation; best action may differ, depending on circumstances or patients' societal values

2B
Clarity of risk/benefit: risk/benefit unclear
Implications: weak recommendation; alternative approaches likely to be better for some patients under some circumstances

2C
Clarity of risk/benefit: risk/benefit unclear
Implications: very weak recommendation; other alternatives may be equally reasonable

COST ANALYSIS

Cost-effectiveness of Usual Care (UC) Versus Anticoagulant Management Service (AMS)

Because of improved outcomes with fewer hospitalizations and emergency department visits, the management of anticoagulation therapy by an anticoagulant management service may prove to be cost effective. Gray et al. estimated a savings of $860 per patient-year of therapy in 1986 due to reduced hospital days in a study of patients treated by an anticoagulant management service versus usual care. Chiquette et al. found a savings of $1,621 per patient-year of therapy in their comparative study due to a significant reduction in hospitalizations and emergency department visits. Last, Wilt et al. found an extremely high rate of savings ($4,072 per patient-year of therapy) due to reduced utilization of services (see table 4 of the original guideline document). These observations need to be validated by randomized studies.

METHOD OF GUIDELINE VALIDATION

Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

The initial guidelines were prepared by the chapter committee (the primary authors) and then reviewed separately by the Committee Co-Chairs and methodology experts and finally by the entire group of Consensus Guideline participants.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Excerpted by the National Guideline Clearinghouse (NGC):

The grading scheme is defined at the end of the Major Recommendations.

Practical Dosing

1. For the initiation of and maintenance dosing of warfarin, commence therapy with an average maintenance dose of 5 mg (grade 2A compared to a dose of 10 mg). Starting doses of <5 mg might be appropriate for elderly patients, patients with impaired nutrition or liver disease, and in patients with a high risk for bleeding.

Management of Nontherapeutic International Normalized Ratios

1. For patients with international normalized ratios greater than the therapeutic level but <5.0 who do not have significant bleeding, lower the dose or omit a dose and resume therapy at a lower dose when the international normalized ratio is at the therapeutic level. If the international normalized ratio is only minimally greater than the therapeutic range, no dose reduction may be required (grade 2C).
2. For patients with international normalized ratios >5.0 but <9.0 with no significant bleeding, omit the next one or two doses, monitor the international normalized ratio more frequently, and resume therapy at a lower dose when the international normalized ratio is at the therapeutic level. Alternatively, omit the dose and administer vitamin K_1, 1 to 2.5 mg orally, particularly if the patient is at increased risk of bleeding. If more rapid reversal is required because the patient requires urgent surgery, administer vitamin K_1, 2 to 4 mg orally, with the expectation that a reduction of the international normalized ratio will occur in 24 hours. If the international normalized ratio is still high, administer an additional dose of vitamin K_1, 1 to 2 mg orally (all grade 2C compared with no treatment).
3. For patients with international normalized ratios >9.0 with no significant bleeding, hold off on warfarin therapy and administer a higher dose of vitamin K_1, 3 to 5 mg orally, with the expectation that the international normalized ratio will be reduced substantially in 24 to 48 hours. Monitor the international normalized ratio more frequently and administer additional vitamin K_1 if

necessary. Resume therapy at a lower dose when the international normalized ratio reaches the therapeutic level (all grade 2C compared with no treatment).
4. For patients with international normalized ratios > 20 with serious bleeding, hold off on warfarin therapy and administer vitamin K_1, 10 mg by slow intravenous infusion, supplemented with fresh plasma or prothrombin complex concentrate, depending on the urgency of the situation. Administration of vitamin K_1 can be repeated every 12 hours (grade 2C).
5. For patients with life-threatening bleeding, hold off on warfarin therapy and administer prothrombin complex concentrate supplemented with vitamin K_1, 10 mg by slow intravenous infusion. Repeat this treatment as necessary, depending on the international normalized ratio (grade 2C).

These recommendations remain unchanged from the 1998 American College of Chest Physicians recommendations. If the continuation of warfarin therapy is indicated after the administration of high doses of vitamin K_1, then heparin can be given until the effects of vitamin K_1 have been reversed and the patient becomes responsive to warfarin.

Management of Oral Anticoagulation During Invasive Procedures

1. For patients with low risk of thromboembolism (e.g., patients without venous thromboembolism for > 3 months or patients who have experienced atrial fibrillation who do not have a history of stroke), stop warfarin therapy approximately 4 days before surgery, allow the international normalized ratio to return to a near-normal level, briefly administer postoperative prophylaxis (if the intervention itself creates a higher risk of thrombosis) using low-dose heparin, 5,000 U subcutaneously, and simultaneously begin warfarin therapy (grade 2C).
2. For patients with intermediate risk of thromboembolism, stop warfarin therapy approximately 4 days before surgery, allow the international normalized ratio to fall, cover the patient with low-dose heparin, 5,000 U subcutaneously, beginning 2 days before surgery or with a prophylactic dose of low-molecular-weight-heparin, and then commence low-dose heparin (or low-molecular-weight-heparin) and warfarin therapy after surgery (grade 2C).
3. For patients with high risk of thromboembolism (e.g., patients with a recent [<3 months] history of venous thromboembolism, patients with a mechanical cardiac valve in the mitral position; or an old model of cardiac valve [ball/cage]), stop warfarin therapy approximately 4 days before surgery, allow the international normalized ratio to return to a normal level, begin therapy with full-dose heparin or full-dose low-molecular-weight-heparin as the international normalized ratio falls (approximately 2 days before surgery). Heparin can be administered as a subcutaneous injection on an outpatient basis, can then be given as a continuous intravenous infusion after hospital admission in preparation for surgery, and can be discontinued 5 hours before surgery with the expectation that the anticoagulant effect will have worn off at the time of surgery. It is also possible to continue the administration of subcutaneous heparin or low-molecular-weight-heparin and to stop therapy 12 to 24 hours before surgery with the expectation that the anticoagulant effect will be very low or will have worn off by the time of surgery (all grade 2C).

4. For patients with low risk of bleeding, continue warfarin therapy at a lower dose and operate at an international normalized ratio of 1.3 to 1.5, an intensity that has been shown to be safe in randomized trials of gynecologic and orthopedic surgical patients. The dose of warfarin can be lowered 4 or 5 days before surgery. Warfarin therapy then can be restarted after surgery and supplemented with low-dose heparin, 5,000 U subcutaneously, if necessary (grade 2C).
5. For patients undergoing dental procedures who are not considered to be at high risk for bleeding, the guideline developers recommend that warfarin therapy not be discontinued. In patients at high risk for bleeding, the guideline developers recommend that warfarin therapy be discontinued (all grade 2C).
6. For patients undergoing dental procedures in whom local bleeding must be controlled, tranexamic acid or epsilon amino caproic acid mouthwash can be administered without interrupting anticoagulant therapy (grade 2B).

Risk Factors for Adverse Events (Hemorrhage)

1. For individuals who are otherwise good candidates for anticoagulation therapy, do not withhold therapy because of a patient's age (grade 1C).
2. Monitor elderly patients more carefully to maximize the time within therapeutic range.

Models of Anticoagulation Management

1. In comparing useful care with anticoagulation management service, the guideline developers recommend that clinicians employ a systematic process to manage oral anticoagulation dosing that includes a knowledgeable provider, reliable prothrombin-time monitoring, and an organized system of follow-up, patient communication, and education (grade 1C).
2. Point-of-care patient self-testing is for selected individuals who are willing and able to perform self-testing and are suitably trained. We recommend this model as an alternative to a useful care model of international normalized ratio monitoring and management to achieve a greater time within therapeutic range (grade 2B).
3. Computer software programs for dose management must be considered individually based on well-designed clinical outcome studies. We recommend consideration of those software programs demonstrated to provide dosing decisions equivalent to a better than physician management, especially in high-volume anticoagulation programs (grade 2B).

Definitions:

Grades of recommendations:

The rating scheme framework captures the trade-off between benefits and risks (1 or 2) and the methodologic quality of the underlying evidence (A, B, C+, or C).

1A

Clarity of risk/benefit: risk/benefit clear
Methodological strength of supporting evidence: randomized controlled trials without important limitations
Implications: strong recommendation; can apply to most circumstances, without reservation

1B

Clarity of risk/benefit: risk/benefit clear
Methodological strength of supporting evidence: randomized controlled trials with important limitations (inconsistent results, methodologic flaws*)
Implications: strong recommendation; likely to apply to most patients

1C+

Clarity of risk/benefit: risk/benefit clear
Methodological strength of supporting evidence: no randomized controlled trials, but randomized controlled trial results can be unequivocally extrapolated; or, overwhelming evidence from observational studies
Implications: strong recommendation; can apply to most patients in most circumstances

1C

Clarity of risk/benefit: risk/benefit clear
Methodological strength of supporting evidence: observation studies
Implications: intermediate-strength recommendation; may change when stronger evidence available

2A

Clarity of risk/benefit: risk/benefit unclear
Methodological strength of supporting evidence: randomized controlled trials without important limitations
Implications: intermediate strength recommendation; best action may differ, depending on circumstances or patients' societal values

2B

Clarity of risk/benefit: risk/benefit unclear
Methodological strength of supporting evidence: randomized controlled trials with important limitations (inconsistent results, methodologic flaws*)
Implications: weak recommendation; alternative approaches likely to be better for some patients under some circumstances

2C

Clarity of risk/benefit: risk/benefit unclear
Methodological strength of supporting evidence: observational studies
Implications: very weak recommendation; other alternatives may be equally reasonable

*Such situations include randomized controlled trials with lack of blinding, and subjective outcomes, in which the risk of bias in measurement of outcomes is high; and randomized controlled trials with large loss to follow-up.

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified for each recommendation (refer to "Major Recommendations").

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate management of oral anticoagulants may maximize therapeutic effectiveness while reducing hemorrhagic risk.

The clinical effectiveness of oral anticoagulants has been established in a variety of conditions, based on well-designed clinical trials. Oral anticoagulants are effective for primary and secondary prevention of venous thromboembolism, for prevention of systemic embolism in patients with tissue or mechanical prosthetic heart valves or atrial fibrillation, for prevention of acute myocardial infarction in patients with peripheral arterial disease, for prevention of stroke, recurrent infarction, or death in patients with acute myocardial infarction, and for prevention of myocardial infarction in men at high risk. Although effectiveness has not been proven by a randomized trial, oral anticoagulants are indicated for prevention of systemic embolism in high-risk patients with mitral stenosis. For most indications, a moderate anticoagulant effect (international normalized ratio 2.0 to 3.0) is appropriate.

POTENTIAL HARMS

- Bleeding is the main complication of oral anticoagulation therapy. The most important factor influencing the risk of bleeding is the intensity of anticoagulant therapy. Bleeding can range from minor events, such as brief epistaxis to a fatal or life-threatening episode. A number of studies have shown what amounts to an exponential increase in hemorrhagic events as the international normalized ratio increases greater than 5.0.
- Other than hemorrhage, the most important side effect of warfarin is skin necrosis. This uncommon complication is usually observed on the third to eighth day of therapy and is caused by extensive thrombosis of the venules and capillaries within the subcutaneous fat.
- Discontinuation of anticoagulation therapy can increase the risk of thrombosis.

- Oral anticoagulants cross the placenta and can produce a characteristic embryopathy, central nervous system abnormalities, fetal bleeding, or increased rates of fetal death.
- High doses of vitamin K_1, though effective, may lower the international normalized ratio more than is necessary and may lead to warfarin resistance for up to a week. Intravenous injection may be associated with anaphylactic reactions, and there is no definitive evidence that this serious, but rare, complication can be avoided by using low doses.

Subgroups Most Likely to be Harmed:

- Several patient characteristics have been shown to be associated with higher odds of bleeding during anticoagulation therapy. The patient factor most consistently demonstrated to be predictive of episodes of major bleeding is a history of bleeding (especially gastrointestinal bleeding). Other factors that have been shown to be associated include a history of stroke and the presence of a serious comorbid condition, such as renal insufficiency, anemia, or hypertension. The relationship between older age and anticoagulant-associated bleeding is controversial.
- Pregnant women who take oral anticoagulants are at increased risk of complications of pregnancy.
- Patients who are at increased risk of thrombosis include patients with mechanical heart valves, atrial fibrillation as well as other risk factors.

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

Interpreting the Recommendations

The authors of these guidelines offer recommendations that should not be construed as dictates by the readers, including clinicians, third-party payers, institutional review committees, and courts. In general, anything other than a 1A recommendation indicates that the chapter authors acknowledge that other interpretations of the evidence and other clinical policies may be reasonable and appropriate. Even grade 1A recommendations will not apply to all circumstances and all patients. For instance, the guideline developers have been conservative in their considerations of cost, and have seldom downgraded recommendations from 1 to 2 on the basis of expense. As a result, in jurisdictions in which resource constraints are severe, alternative allocations may serve the health of the public far more than some of the interventions that we designate grade 1A. This will likely be true for all less-industrialized countries. However, a weak recommendation (2C) that reduces resource consumption may be more strongly indicated in less-industrialized countries.

Similarly, following grade 1A recommendations will at times not serve the best interests of patients with atypical values or preferences. For instance, consider patients who find anticoagulant therapy extremely aversive, either because it interferes with their lifestyle (prevents participation in contact sports, for instance) or because of the need for monitoring. For such patients, clinicians may reasonably conclude that following some grade 1A recommendations for

anticoagulation will be a mistake. The same may be true for patients with particular comorbidities (such as a recent GI bleed or a balance disorder with repeated falls) or other special circumstances (such as very advanced age).

The guideline developers trust that these observations convey their acknowledgment that no guidelines or recommendations can take into account the often compelling idiosyncrasies of individual clinical circumstances. No clinician and no one charged with evaluating the actions of a clinician should attempt to apply their recommendations in a rote or blanket fashion.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Living with Illness
Staying Healthy

IOM DOMAIN

Effectiveness
Patient-centeredness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Ansell J, Hirsh J, Dalen J, Bussey H, Anderson D, Poller L, Jacobson A, Deykin D, Matchar D. Managing oral anticoagulant therapy. Chest 2001 Jan;119(1 Suppl):22S-38S. [168 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2001 Jan

GUIDELINE DEVELOPER(S)

American College of Chest Physicians - Medical Specialty Society

SOURCE(S) OF FUNDING

Funding was supplied by DuPont Pharmaceuticals.

GUIDELINE COMMITTEE

American College of Chest Physicians Consensus Panel on Antithrombotic Therapy

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

This guideline is an updated version of the 1998 Fifth ACCP consensus conference on antithrombotic therapy (Chest 1998 Nov;114[5 Suppl]:439S-769S).

GUIDELINE AVAILABILITY

Electronic copies of the updated guideline: Available from the Chest - The Cardiopulmonary and Critical Care Journal Web site.

Print copies: Available from the American College of Chest Physicians, Products and Registration Division, 3300 Dundee Road, Northbrook IL 60062-2348.

AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- Sixth ACCP Consensus Conference on Antithrombotic Therapy (2001): summary recommendations. Northbrook, IL: ACCP, 2001. (Quick reference guide for clinicians).

Electronic copies: Available from the American College of Chest Physicians Web site. (HTML, Portable Document Format [PDF], and downloadable files intended for use with Palm OS compatible devices are available.)

Print copies: Available from the American College of Chest Physicians, Products and Registration Division, 3300 Dundee Road, Northbrook IL 60062-2348, or by calling 1 (800) 343-2227.

PATIENT RESOURCES

None available

NGC STATUS

This summary was completed by ECRI on August 26, 2001. The information was verified by the guideline developer on September 24, 2001.

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